National Aeronautics and Space Administration

NASAfacts

STENNIS SPACE CENTER'S ROLE IN THE FUTURE OF SPACE EXPLORATION

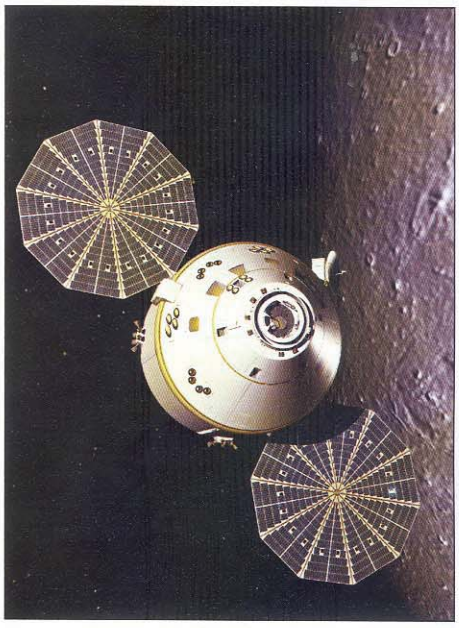
An artist's rendition illustrates the Ares I crew launch vehicle (left) and Ares V cargo launch vehicle.

NASA'S CONSTELLATION PROGRAM: AMERICA'S PLAN TO GO BACK TO THE MOON AND POSSIBLY BEYOND

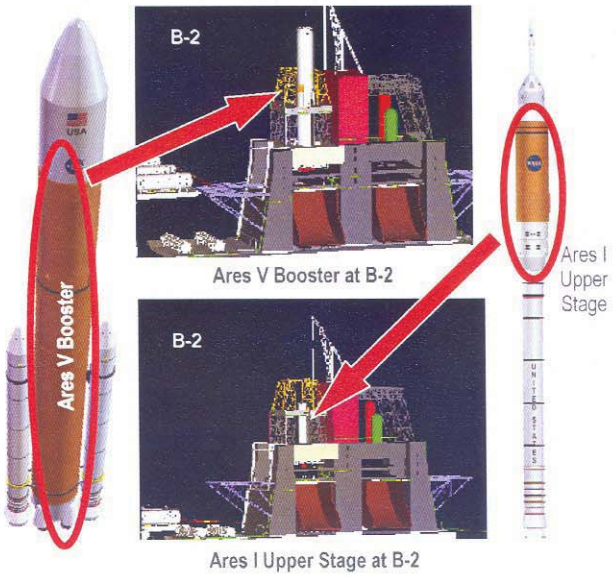
NASA is developing new spacecraft that will transport humans and cargo to establish colonies on the moon and possibly journey beyond. Building on technologies of the Apollo and Space Shuttle programs, NASA's 21st century exploration system will be affordable, reliable, versatile and safe. The new spacecraft, Ares I, Ares V and Orion, will replace the space shuttle, which will retire in 2010. NASA's John C. Stennis Space Center will be responsible for rocket propulsion testing for the upper stage of the Ares I and Ares V, and the main stage of the Ares V.

Orion

America's new generation of explorers will travel to the moon in crews of four aboard NASA's Orion crew exploration vehicle. Orion will be launched into low-Earth orbit by the Ares I crew launch vehicle, and NASA's Ares V cargo launch vehicle will be used to carry the Altair lunar lander and the Earth departure stage into orbit to enable human exploration of the moon.



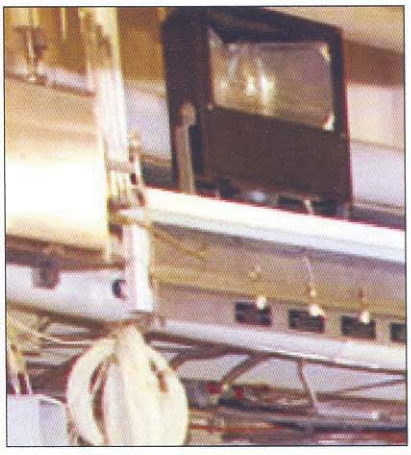
NASA's Orion crew exploration vehicle.



Development and flight-stage acceptance testing for the Ares I Upper Stage and for the Ares V Core Booster Stage will be conducted on Stennis' dual-position B Stand, as shown in these concept illustrations.

Ares I – Crew Launch Vehicle

Astronauts will ride to orbit on Ares I, which will use a single five-segment solid rocket booster, a derivative of the space shuttle's solid rocket booster, for the first stage. A liquid oxygen/liquid hydrogen J-2X engine, derived from the J-2 engine used on Apollo's second and third stages, will power the crew exploration vehicle's second stage.



Core components of the J-2X engine are installed on Stennis' A-1 Test Stand for testing, which began in December 2007.

Core components of the Apollo-era engine are being tested on the A-1 Test Stand at Stennis Space Center. The A-1 Test Stand, site of the first space shuttle main engine test in 1975, held its last test for that program Sept. 29, 2006. The test stand began a new chapter in its operational history in 2006, when it was handed over to the Constellation Program for testing the J-2X components. Data from the tests will help NASA build the next generation J-2X engine.

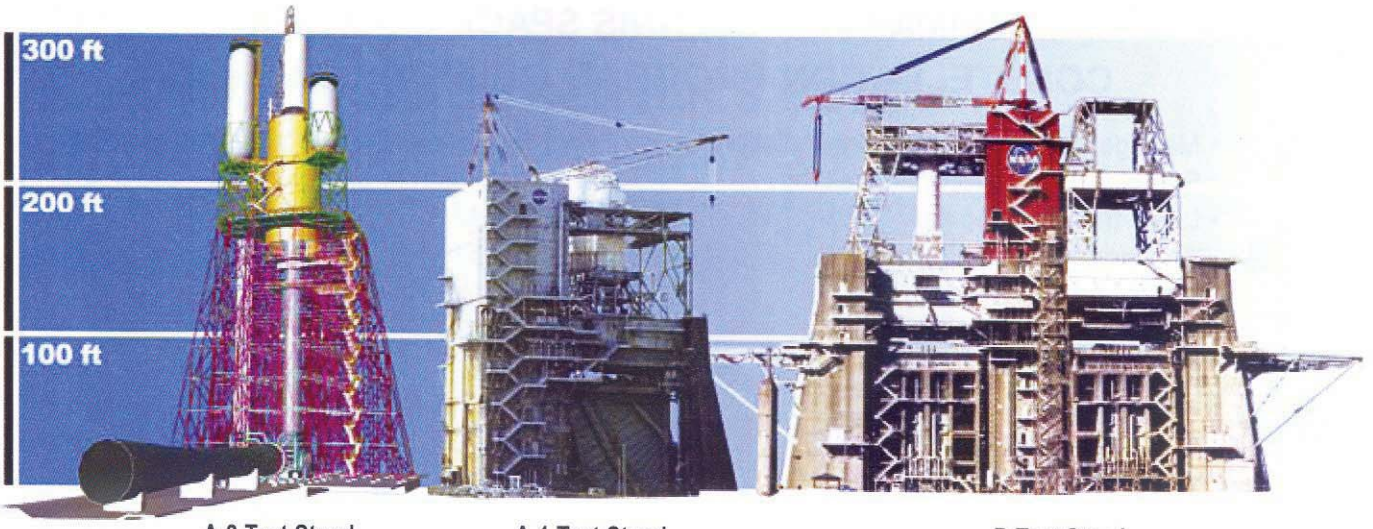
The Ares I will be able to lift more than 55,000 pounds to low Earth orbit. The new crew transportation system will be 10 times safer than the space shuttle, primarily due to its in-line design and launch abort system.

Ares V – Cargo Launch Vehicle

Ares V, a heavy-lift launch vehicle, will use five RS-68B liquid oxygen/liquid hydrogen engines mounted below a larger version of the space shuttle's external tank, and two five-segment solid propellant rocket boosters for the first stage. The second Earth departure stage will use the J-2X engine. The Ares V will stand 360 feet tall and be able to lift more than 286,000 pounds to low Earth orbit. It will carry cargo and components into orbit needed to go to the moon and possibly beyond.

Pratt & Whitney Rocketdyne's RS-68B engine (inset) will power the core stage of the Ares V. Testing for commercial applications of the RS-68 is under way at SSC's B-1 Test Stand.

The RS-68B is an improved, updated version of the RS-68 engine, currently the most powerful liquid oxygen /liquid hydrogen rocket engine in existence. The RS-68 is capable of producing 650,000 pounds of thrust at sea level. The prime contractor for the RS-68 engine is Pratt & Whitney Rocketdyne of Canoga Park, Calif. All RS-68B engines, like the current RS-68 engine, will be assembled and test-fired at Stennis Space Center.



A-3 Test Stand A-1 Test Stand B Test Stand

A-3 TEST STAND

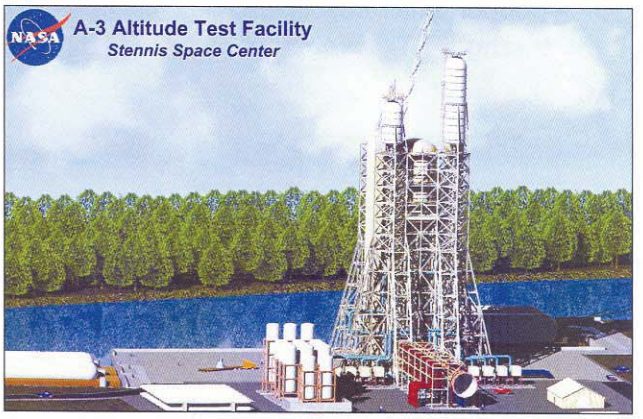
On May 8, 2007, NASA announced its intention to build a new test stand at Stennis Space Center for testing the J-2X rocket engine. The A-3 Test Stand will allow engineers to test the J-2X engine's operating parameters by simulating conditions at different altitudes. To do that, the test stand will generate approximately 4,620 pounds per second of steam and use it to reduce the engine test cell pressure.

Construction began on the A-3 Test Stand in summer 2007, with the first test scheduled to be conducted in late 2010 or early 2011. The structure is the first large test stand to be built since Stennis was established in the 1960s.

Simultaneous with A-3's construction was a series of tests conducted in Stennis' E Test Complex on a miniature version of A-3's exhaust diffuser. The tests to validate the diffuser's design will help engineers work out any issues before the full-scale version is built.

A-3 Test Stand Capabilities

- Will enable long-duration (550 seconds) J-2X testing
- Will enable engine start and run at pressures as low as 0.16 pounds per square inch absolute, a vacuum condition simulating the equivalent of 100,000 feet in altitude
- Will enable engine gimballing (rotating) in a 5-degree square pattern
- Will accommodate a 200-millisecond engine shutdown and protect the engine from damage due to shutdown pressure
- Will enable J-2X sea-level testing and launch vehicle stage testing



Artist concept shows the design of the A-3 Test Stand for proving the J-2X engines that will carry humans back to the moon.

A-3 Test Stand Structure

- Open steel frame design
- 300 feet tall
- Structure and foundation designed for thrust levels of up to 1 million pounds
- Two-stage steam ejector system to achieve simulated altitude conditions

SUMMARY OF STENNIS SPACE CENTER'S CONSTELLATION PROGRAM RESPONSIBILITIES:

- Manage and integrate all Constellation Systems rocket propulsion testing
- Lead the development, certification and acceptance testing for the upper stage engine
- Lead acceptance testing for flight upper stage assembly
- Lead development and acceptance testing of Ares V core booster and Earth departure stages
- Lead development and acceptance testing of the RS-68B engine for Ares V stage
- Support Altair descent stage propulsion testing
- Support design, development, testing and evaluation of propellant test and delivery systems; ground engine checkout facility simulation and analysis; and engine and launch facility planning
- Support flight performance systems integration, and systems engineering processes and tools
- Integrate and coordinate propulsion test activities with the rocket propulsion test management board
- Support the refinement and design of future elements

An aerial photo shows the trio of stands used to test rocket engines and stages at Stennis Space Center near Bay St. Louis, Miss.

MORE INFORMATION, LINKS:

Details about Constellation Program:
http://www.nasa.gov/mission_pages/constellation/main/index.html

Information on Stennis Space Center:
htttp://www.nasa.gov/centers/stennis/home/index.html